LINEAR EQUATIONS: FORMULAS FOR GRAPHING

Section 5.4: FINDING SLOPE FROM RISE AND RUN

- $Slope = \frac{Rise}{Run} = \frac{Y}{X}$ The letter that represents slope is *m*.
- Formula for slope: $m = \frac{y_2 - y_1}{x_2 - x_1}$ Note: Two points are needed.
- The x value is always written first and the y value second.

Example: $\overset{x_1}{(-2,} \overset{y_1}{3)} \quad \overset{x_2}{(4,} \overset{y_2}{5)}$ $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-3}{4-(-2)} = \frac{2}{4+2} = \frac{2}{6} = \frac{1}{3}$

Section 5.4: SLOPE-INTERCEPT FORM OF A LINEAR EQUATION

- Formula: y = *m*x + *b* where *m* is the slope and *b* is the y intercept where the points are (0, *b*)

Example: y = 4x – 2 Therefore, the slope is 4 or 4/1 and the y intercept = -2

Section 5.4: FINDING X AND Y INTERCEPTS

- The slope-intercept form makes it very easy to find the y-intercept since it is given by b in the equation y = mx + b. Note: If you set x to equal zero, then y will equal b.
- To find the x intercept, substitute zero for y in the equation.

Example: y = -3x + 12 Set y to equal zero

0 = -3x + 12 Move the 22 to the other side by subtracting it
-12 = -3x – 12 Clean up the equation
-12 = -3x Divide both sides by -3 to solve for x
4 = x

Section 5.4: SLOPE OF A HORIZONTAL LINE

- The two **y coordinates** are the same causing the slope to be zero.
- Example: $\overset{x_1}{(2,} \overset{y_1}{-3)} \quad \overset{x_2}{(4,} \overset{y_2}{-3)}$ The line is horizontal across the y-axis, so y = b.
- $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-(-3)}{4-2} = \frac{-3+3}{2} = \frac{0}{2} = 0$

Section 5.4: SLOPE OF A VERTICAL LINE

- The two **x coordinates** are the same. Slope is undefined because we cannot divide by zero.
- Example: $\overset{x_1}{(3,} \overset{y_1}{-5)} \quad \overset{x_2}{(3,} \overset{y_2}{2)}$ The line is vertical through the x-axis, so x = a; a is the x intercept found by setting y to zero.
- $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-(-5)}{3-3} = \frac{2+5}{0} = \frac{7}{0} = \textit{undefined}$

Section 5.5: STANDARD FORM OF A LINEAR EQUATION

- Formula: Ax + By = C
- When given a formula in slope intercept form such as: y = -2x + 2, rearrange into standard form of the line: Ax + By = C by doing the following steps:

$$y = -2x + 2$$
$$+2x \quad +2x$$
$$2x + y = 2$$

Add *x* term to both sides

Clean up the equation

Section 5.5: POINT SLOPE FORM OF A LINEAR EQUATION

- Formula: $y - y_1 = m(x - x_1)$ m = slope
- The coordinates of x_1 *and* y_1 are taken from a given point: Example (-2, 3)
- If given two points, first calculate the slope from the above formula.

Example: $\overset{x_1}{(-2,}\ \overset{y_1}{3)}\quad \overset{x_2}{(4,}\ \overset{y_2}{5)}$ $\qquad m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{5-3}{4-(-2)} = \dfrac{2}{4+2} = \dfrac{2}{6} = \dfrac{1}{3}$

Then, take the first point and the slope and plug into the point slope formula.

$$y - 3 = \frac{1}{3}\,(x - (-2))$$
$$y - 3 = \frac{1}{3}(x + 2)$$

Change the two negatives to a positive.

- If given slope and one point, plug into the formula as above.

Section 5.6: PARALLEL LINES

- If two different lines have the same slope (m) and different y intercepts, they are parallel.
- Examples: y = **2**x + 4 AND y = **2**x - 5

Section 5.6: PERPENDICULAR LINES

- If the slopes of two lines are *m* and $-\dfrac{1}{m}$, the lines are perpendicular.
- Example:

$$y = 3x + 2 \quad \textit{The slope of this line is } +\frac{3}{1}$$
$$y = -\frac{1}{3}x + 6 \quad \textit{The slope of this line is } -\frac{1}{3}$$